

# FLOPS

**A long pulse, high current, spallation source proposal**

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# OUTLINE

- 1 The objective
- 2 Selection criteria
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- 4 The proposal

# The objective

What?

# Task

CAS - project design # 2

- ✓ Green field accelerator design
- ✓ Pulse length: 2 - 3 ms
- ✓ Repetition rate: 10 - 20 Hz
- ✓  $P \approx 5$  MW
- ✓ 1 - 8 GeV - Our Decision: 1 GeV
- ✓ Particle type: p or  $H^-$

# **Selection criteria**

Decision helpers

# Selection criteria

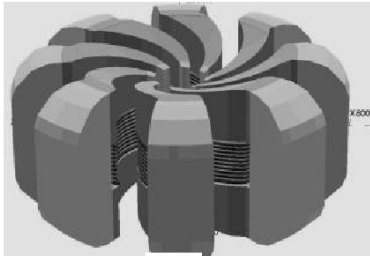
- ✓ Fulfills specs
- ✓ Maturity of technology vs. technology pioneering
- ✓ Cost of installation
- ✓ Cost of operation
  - ▶ Electric power
  - ▶ Spare part
  - ▶ Man power
- ✓ Geometric footprint
- ✓ Simplicity & Reliability
- ✓ Flexibility/ Upgradeability

# Alternatives

Just in case you don't like our real proposal

# Cyclotron

Stacked

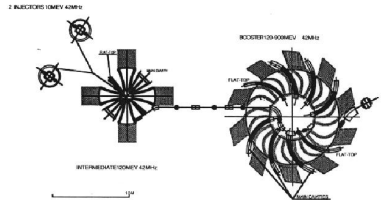


15 m

800MeV, 2mA per ring,  
superconducting, Peter McIntyre  
and Akhdior Sattarov

p and  $H^-$  in same cyclotron?

Staged

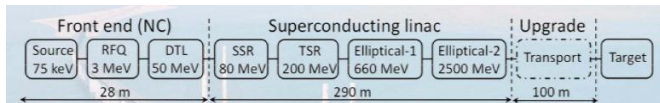


1GeV, 5mA, P.Mandrillon,  
N.Fietier, C.Rubbia

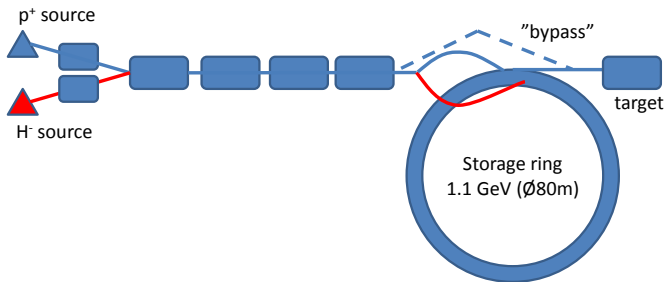


# first more reasonable proposal

## ESS concept:



## Alternative concept:



# first more reasonable proposal - Detail

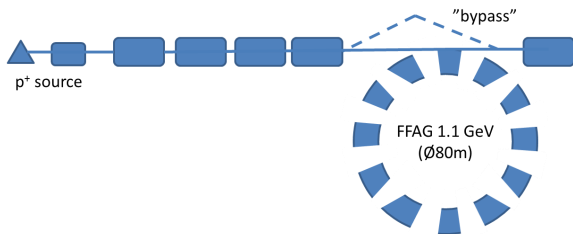
- ✓ Linac at same time p and  $H^-$  in case of bypass
- ✓ storage ring with permanent magnets  $l \approx 80$  m
- ✓ horizontal + vertical mti for protons and  $H^-$  from opposite side
- ✓ coasting beam (no longitudinal and reduced transverse space charge)
- ✓ no ramping/ timing - relaxed control system
- ✓ Slow 3<sup>rd</sup> order resonant extraction

Laser stripping needed as foil would blow up the circulating beam

# The proposal

For your consideration

# Linac into FFAG

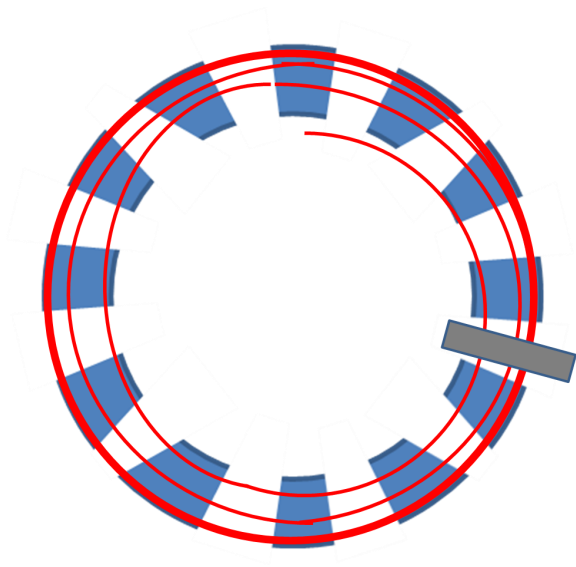


✓ FFAG = accelerator + storage ring!

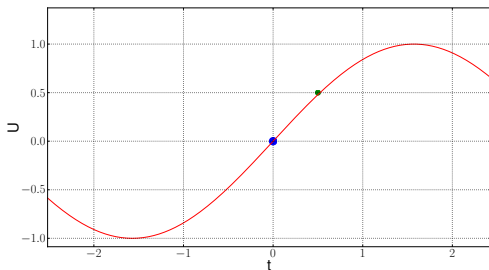
✓ + transversal phasespace painting

FLOPS = Ffag LOnG Puls Source

## Some sketch of the idea



# Injection energy



- ✓ Assume Linac RF: 352.2MHz
- ✓ 1 GeV in 80m ring:  $0.3\mu s$
- ✓ Allow RF phase change of 10%  $\rightarrow \Delta t_{rev} = 0.3 \text{ ns} \rightarrow$   
 $E_{inj} = 998.5 \text{ MeV}$
- ✓ Little energy variation  $\rightarrow$  “simple” FFAG magnets

# Extraction

- ✓ Slow resonant extraction
- ✓ “slow” acceleration via RF noise using the existing cavities (somehow like a synchro-cyclotron)
- ✓ Option to make short pulse by including a kicker

# Summary

- ✓ Linac is the most conventional, reliable option (dual particle option?)
- ✓ Many other unconventional ways (like the Linac-FFAG combination) still requiring theoretical beam physics considerations → well suited for CAS brain-pool discussions.